hydrogen lines and the presence of the principal arc lines of iron as faint absorption lines point to a normal classification of about A5. It is a singular coincidence that two stars, both of peculiar but very similar spectra, should be characterized by such large velocities. The single spectrogram of Lalande 5761 gives a value of -144^{km}, while four spectrograms of Lalande 28607 give -170^{km}.

The Spectra of Some Individual Stars in the Hercules Cluster.—Two photographs were recently obtained by Mr. PEASE of the spectrum of the *Hercules* cluster (Messier 13), using a small slit spectrograph at the primary focus of the 60-inch reflector. The exposures were 21 and 22 hours respectively, and the slit width was twice as great for the second exposure as for the first. The spectrograph is mounted in the opening of the double slide plate-holder regularly used for direct photography, so that very accurate guiding is possible. As a result the spectra of individual stars appear on the photographs. Of these it has been possible to classify six upon the first photograph and thirteen upon the second, or a total of nineteen separate stars, since the slit was set at two different positions for the two exposures. Using as a unit five divisions of the Harvard scale, the stars are classified as follows:—

A_0	2
A_5	5
F_0	2
F_5	8
G_0	2

Perhaps the two most important features of these results are: First, the absence of any stars of very late types of spectrum; second, the fairly regular succession of the spectra, agreeing with what is generally considered the order of stellar development. It is also clear that conclusions as to the spectral types of the stars in clusters must be based upon photographs showing the individual stars. W. S. ADAMS.

MOUNT WILSON SOLAR OBSERVATORY.

NOTE ON THE GEGENSCHEIN.

Doubtless many, whether amateurs or professional astronomers, have never seen this very difficult object, and a word or two as to its history and appearance may not be out of place.

The Gegenschein, or zodiacal counterglow, is an exceedingly faint luminous patch some ten to twenty degrees in diameter, which can be made out by a keen eye at the point directly opposite to the Sun. It was first definitely observed by BRORSEN about the middle of the last century, and has since been systematically observed by a number of astronomers, in particular by Professor BARNARD, who has followed it regularly for twenty years.

Professor BARNARD describes it as, in general, quite easy to see, and his observations on its position are most accordant; its central point appears to be always exactly antipodal to the Sun in the sky. It is, of course, useless to attempt to see the Gegenschein from a position in or near a brilliantly lighted city, or when the Sun's antipodal point falls in or close to the Milky Way. One member of the Lick Observatory staff finds no difficulty in always picking up the appearance; for my own part, I personally find it a very difficult object. Sometimes I can make it out without any trouble, while at other times, with conditions fully as favorable, I cannot see it at all.

A great many theories have been put forward to explain the cause of this faint luminous patch, none of which are perhaps entirely satisfactory. Its appearance changes at different times of the year; in September and the first part of October it is large, round, and distinct. About the middle of October Professor BARNARD finds that it apparently shrinks to a mere condensation on a zodiacal band extending a long distance along the ecliptic. The fact that it is frequently best seen in a sky that is not too pure has always given Professor BARNARD the impression that it is in some way connected with our own atmosphere, though he admits that the absence of any sensible parallax in the appearance militates against this view.

Mr. EVERSHED suggested that it might be a quasi-tail to the Earth, produced by the escape of molecules of hydrogen and helium from the Earth's atmosphere, which are driven off in a direction opposite to the Sun in a similar manner to the formation of a comet's tail. Here, also, the absence of any parallactic effect forms a strong objection.

Professor SEARLE suggested that it might be due to finely divided matter in the asteroid zone. At the point opposite to the Sun such small bodies would not only be nearer to the

Earth, being in opposition, but would also exhibit their full phase effect in the reflected sunlight which they would send to us; both causes would tend to give a maximum of light opposite the Sun—a Gegenschein. The fact that this phenomenon is frequently fairly well defined and distinct, with no gradual shading off on each side of the antipodal point, makes this theory less probable.

One of the most interesting of the theories of the Gegenschein is the meteoric theory, first suggested by GLYDEN and later by Professor W. H. PICKERING, but independently derived and thoroughly worked out by MOULTON. The essentials of this theory are, in brief, as follows: It is mathematically possible that bodies of infinitesimal mass, as a special case in the Problem of Three Bodies, should congregate in the neighborhood of a point exactly opposite to the Sun and about 900,000 miles from the Earth. The orbits of these small bodies would not be stable, doubtless they would make a few revolutions about this critical point, and then pass on; on the average, as many would be captured for a time as those which escape, but the effect would be that of a condensation, and MOULTON'S theory is that the Gegenschein is due to light reflected from this swarm of temporarily captured meteoric particles. As it has been estimated that ten million meteors enter the Earth's atmosphere daily, the total number of such small particles in the solar system must be enormous.

Hopeless as it may seem, *a priori*, there is just a possibility that this theory might be tested. If the theory is true, the great majority of these particles must be small; a failure to photograph them, then, would not necessarily disprove the theory. However, it is probable that an object one hundred feet in diameter would leave a faint trace on a Crossley negative in an exposure of two hours, if the body were at a distance of 900,000 miles and if its albedo were equal to that of the ordinary asteroid. Were a meteor of this rather unusual size to be caught in this critical region, its value as a laboratory example of a case in the Problem of Three Bodies would be very great. Though a successful result seemed most improbable, I thought it worth while to make the test. The photographs are quite difficult to secure; the average motion of the hypothetical meteoric bodies would be about 145 seconds of

arc per hour along the ecliptic. As the maximum range of the moving-wire system in the Crossley guiding eye-piece is somewhat less than 100 seconds of arc, it was necessary to guide by means of the long finder, whose focal length is approximately that of the main instrument, with an attached micrometer; the bodies would move one second of arc in about twenty-four seconds of time. Two plates were taken on September 3d, with exposures of one hour each; the second check plate is necessary to be able to reject the small flaws, very faint and frequently startlingly like a stellar image, which are too often found on commercial plates. The region photographed was almost precisely at the Sun's antipodal point. The result was entirely negative; no certain trace of any such body was found.

H. D. CURTIS.

NOTE ON COMET *b* 1913 (METCALF).

The second comet of the year was discovered by METCALF, of Taunton, Massachusetts, the night of September 1st, in the constellation of the *Lynx*. Its motion is northward and westward. From observations by Dr. AITKEN of the Lick Observatory, taken on the 2d, 3d and 4th, the orbit was computed by Miss SOPHIA LEVY and myself.

The comet is moving in a plane inclined 143° to the plane of the ecliptic. Its nearest approach to the Sun was September 14th, at a distance of 126,000,000 miles. At the present time it is approaching the Earth and becoming brighter. The closest approach to the Earth will be about 50,000,000 miles, at the end of September. It will continue to increase in brightness until about that time, when it will diminish in brightness very rapidly. It will probably not become bright enough to be visible to the unaided eye.

The comet will continue its northward journey until it is within about 12 degrees of the pole, when it will start southward through *Cepheus*. It is at present in *Camelopardolus*.

The elements of the orbit and a short ephemeris have been published in *Lick Observatory Bulletin*, No. 235.

R. T. CRAWFORD.

September 15, 1913.